Group A *Streptococcus* (GAS),

Invasive Disease

Including Streptococcal Toxic Shock Syndrome (STSS)

DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS

Per N.J.A.C. 8:57, healthcare providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of invasive GAS disease to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. A directory of local health departments in New Jersey is available at http://www.state.nj.us/health/lh/directory/lhdselectcounty.shtml.

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609.588.7500, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.

CDS Communicable Disease Service

NEW JERSEY DEPARTMENT of HEALTH and SENIOR SERVICES

June 2008

1 THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Invasive GAS disease is caused by the bacterium, *Streptococcus pyogenes.* There are over 100 serologically distinct types of *S. pyogenes* within group A. Streptococcal toxic shock syndrome (STSS) is a serious complication associated with infection caused by strains of *S.pyogenes* that produce a pyogenic exotoxin A.

B. Clinical Description and Laboratory Diagnosis

Pharyngitis ("strep throat") is the most common result of infection with GAS. Skin infections (impetigo or pyoderma) are also common. In those two conditions, infection of the deeper tissue or blood is very uncommon. However, in some cases the bacteria may become invasive and cause more severe illness. Invasive GAS may manifest as any of several clinical syndromes, including: (1) pneumonia, (2) bacteremia in association with cutaneous infection, (3) deep soft tissue infection (i.e., necrotizing fasciitis [colloquially referred to as "flesh-eating bacteria"]), (4) meningitis, (5) peritonitis, (6) osteomyelitis, (7) septic arthritis, (8) postpartum sepsis (i.e., puerperal fever), (9) neonatal sepsis, and (10) bacteremia alone. Case-fatality ratios for some of these syndromes can be as high as 10−70%. Risk factors for invasive disease include chickenpox in children, human immunodeficiency virus infection, diabetes mellitus, and chronic cardiac or pulmonary disease.

NOTE: Toddlers (1–3 years of age) with a GAS respiratory tract infection initially may have serous rhinitis and develop a protracted illness with moderate fever, irritability, and anorexia (streptococcal fever). The classic clinical presentation of streptococcal upper respiratory tract infection as acute pharyngitis is uncommon in children younger than three years of age. Rheumatic fever also is uncommon in children younger than three years of age. The second most common site of GAS infection is the skin. Streptococcal skin infections (i.e., pyoderma or impetigo) can result in acute glomerulonephritis, which occasionally occurs in epidemics, but acute rheumatic fever is not a sequela of streptococcal skin infections.

STSS is a severe toxin-mediated illness characterized by sudden onset of high fever (usually temperature > 102˚F), vomiting, profuse watery diarrhea, and myalgia, followed by hypotension (systolic blood pressure < 90 mm Hg) and, potentially, shock. During the acute phase of the illness, a sunburn-like rash is present. One to two weeks after onset, desquamation of the skin occurs, especially on the soles and palms. In addition, there is multiorgan involvement characterized by renal impairment, coagulopathy, acute respiratory distress syndrome, and/or liver involvement (i.e., elevated aminotransferase and bilirubin levels).

Isolation of GAS in the context of the above signs and symptoms is diagnostic; however, Rocky Mountain spotted fever, leptospirosis, and measles should be ruled out. STSS can be fatal; case-fatality ratio is about 4%.

Laboratory diagnosis is based on culture of GAS from a clinical specimen.

C. Reservoirs

Humans are the only reservoir for GAS.

D. Modes of Transmission

The primary mode of transmission of GAS bacteria is person-to-person spread of large respiratory droplets through direct contact with patients or carriers. GAS can also be transmitted through ingestion of contaminated food, most commonly eggs, milk, and milk products, resulting in outbreaks of GAS pharyngitis. Indirect contact through objects is rarely associated with illness, but it has occurred in schools through contaminated wrestling mats and in daycare centers through play food and other shared toys.

Nasal, throat, skin, anal and vaginal carriers of GAS can all serve as sources of infection. STSS in and of itself is not transmitted from person to person, but the bacterium responsible for it is.

E. Incubation Period

The incubation period for GAS pharyngitis is usually one to five days, rarely longer. The incubation period for invasive GAS disease is variable. The median incubation period for postsurgical STSS is two days.

F. Period of Communicability or Infectious Period

In untreated, uncomplicated GAS disease, the infectious period starts several days before onset of symptoms and lasts from ten to 21 days. If purulent discharge is present, the infectious period may be extended to weeks to months. Persons with untreated GAS pharyngitis may carry and transmit the bacteria for weeks or months, with sharply decreasing contagiousness two to three weeks after illness onset.

G. Epidemiology

Estimates of the annual incidence rates of invasive GAS in North America have ranged from 1.5 to 7.0 cases per 100,000. In the United States, the Centers for Disease Control and Prevention (CDC) estimates the rate to be 3.3 cases per 100,000. Of the estimated 10,000−15,000 cases of invasive GAS in the United States each year, between 500 and 1500 cases develop necrotizing fasciitis. Surveillance studies have suggested that 85% of cases occur sporadically in the community, 10% are hospital-acquired, 4% occur in long-term care facilities and 1% occur after close contact with a case. Nosocomial outbreaks and cases of invasive GAS have been traced to healthcare workers who were anal, vaginal, skin or throat carriers of GAS.

The New Jersey Department of Health and Senior Services (NJDHSS) made invasive GAS disease reportable in 1995. From 1996 through 2000, DHSS received approximately 40 cases of disease each year. In 2001, DHSS implemented electronic reporting. From 2001 through 2004, reported GAS cases have averaged approximately 150 cases per year.

Cases of invasive GAS occur year-round with a peak incidence reported during December – March. People who have chronic cardiac or pulmonary disease, diabetes mellitus or HIV infection, or who inject drugs or abuse alcohol are believed to be at higher risk for invasive GAS infection. In children, *varicella* infection has been identified as a significant risk factor. Infection with GAS may be followed by the noninfectious complication of rheumatic fever (characterized by arthritic, cardiac, neurologic signs and symptoms) or glomerulonephritis. One goal of prompt identification and treatment of GAS cases (with at least ten days of antibiotic therapy) is to prevent these sequelae.

Cases of STSS have been associated with childbirth, abortions, vaginal infections, surgical wound infections, focal lesions of the bone or respiratory tract, and cutaneous or subcutaneous lesions. The source of infection is unknown in up to one third of cases. Cases are observed in both sexes.

2 CASE DEFINITION

The NJDHSS and the CSTE/CDC case definitions are not exactly the same. The NJDHSS definition, like the case definition used by states participating in CDC's Emerging Infections Program, specifies that a wound culture associated with necrotizing fasciitis also represents a case of invasive GAS.

NOTE: Case definitions establish uniform criteria for identifying and classifying cases for reporting purposes, and should NOT be used for establishing clinical diagnoses or determining the standard of care necessary for a particular patient. For many conditions of public health importance, action to contain disease should be initiated as soon as a problem is identified; in many circumstances, appropriate public health action should be undertaken even though when available information is insufficient to determine a clinical diagnosis or case status.

A. Clinical Description

1. Invasive GAS Infections

Invasive GAS Infections may manifest as any of several clinical syndromes, including pneumonia, bacteremia in association with cutaneous infection (e.g., cellulitis, erysipelas, or infection of a surgical or nonsurgical wound), deep soft-tissue infection (e.g., myositis or necrotizing fasciitis), meningitis, peritonitis, osteomyelitis, septic arthritis, postpartum sepsis (i.e., puerperal fever), neonatal sepsis, nonfocal bacteremia and STSS (see below).

2. STSS

STSS is a severe illness associated with invasive or noninvasive GAS infection. STSS may occur with infection at any site but most often occurs in association with infection of a cutaneous lesion. Signs of toxicity and a rapidly progressive clinical course are characteristic, and the case-fatality rate may exceed 50%.

An illness with the following clinical manifestations occurring within the first 48 hours of hospitalization or, for a nosocomial case, within the first 48 hours of illness:

- Hypotension defined by a systolic blood pressure less than or equal to 90 mm Hg for adults or less than the fifth percentile by age for children younger than 16 years.
- Multiorgan involvement characterized by two or more of the following:
    - *Renal impairment:* Creatinine greater than or equal to 2 mg/dL (greater than or equal to 177 μmol/L) for adults or greater than or equal to twice the upper limit of normal for age. In patients with preexisting renal disease, a greater than twofold elevation over the baseline level.
    - *Coagulopathy:* Platelets less than or equal to 100,000/mm^3 (less than or equal to 100 x 10^6/L) or disseminated intravascular coagulation, defined by prolonged clotting times, low fibrinogen level, and the presence of fibrin degradation products.
    - *Liver involvement:* Alanine aminotransferase, aspartate aminotransferase, or total bilirubin levels greater than or equal to twice the upper limit of normal for the patient's age. In patients with preexisting liver disease, a greater than twofold increase over the baseline level.
    - *Acute respiratory distress syndrome:* defined by acute onset of diffuse pulmonary infiltrates and hypoxemia in the absence of cardiac failure or by

evidence of diffuse capillary leak manifested by acute onset of generalized edema, or pleural or peritoneal effusions with hypoalbuminemia.

- A generalized erythematous macular rash that may desquamate.
- Soft-tissue necrosis, including necrotizing fasciitis or myositis, or gangrene.

B. Laboratory Criteria for Diagnosis

Isolation of *S. pyogenes* by culture from a normally sterile site (e.g., blood or cerebrospinal fluid, or, less commonly, joint, pleural, or pericardial fluid) OR from a wound culture of a patient with necrotizing fasciitis confirms a case of invasive GAS. Isolation of *S. pyogenes* from a sterile site in association with a clinical presentation of STSS supports a confirmed case of STSS. Isolation of *S. pyogenes* from a nonsterile site in association with a clinical presentation of STSS supports a probable case of STSS.

C. Case classification

CONFIRMED GAS
A case that is laboratory confirmed with the isolation of *S. pyogenes* from a normally sterile site.

CONFIRMED STSS
A case of invasive GAS that is laboratory confirmed with the isolation of *S. pyogenes* from a normally sterile site AND in association with a clinical presentation of STSS as defined above.

PROBABLE GAS
A clinically compatible case epidemiologically linked to a confirmed case.

PROBABLE STSS
A case of invasive GAS that is laboratory confirmed with the isolation of *S. pyogenes* from a nonsterile site AND in association with a clinical presentation of STSS as defined above.

SUSPECT/POSSIBLE GAS OR STSS:
Not used.

3 LABORATORY TESTING SERVICES AVAILABLE AT PHEL

The New Jersey Department of Health and Senior Services Public Health and Environmental Laboratories (PHEL) may confirm the identity of suspected *S. pyogenes* isolates from appropriate clinical sources.

4 PURPOSE OF SURVEILLANCE AND REPORTING REQUIREMENTS

A. Purpose of Surveillance and Reporting

1. To provide information about the disease, its transmission, and methods of prevention.

2. To identify close contacts of the case and provide recommendations for appropriate preventive measures and thus prevent: a) infection and complications in close contacts and b) further spread of disease.

3. To promptly identify clusters or outbreaks of disease in order to initiate appropriate prevention and control measures. If an outbreak of invasive GAS is identified in a community or organization such as a school or daycare center, *varicella* vaccination might be recommended if cases are associated with chickenpox, or prophylactic antibiotics might be recommended to certain groups depending on the number of cases and the community or organization involved.

B. Laboratory and Healthcare Provider Reporting Requirements

1. The New Jersey Administrative Code (N.J.A.C.) 8:57-1.8 stipulates that healthcare providers and laboratories report (by telephone, confidential fax, over the Internet using Communicable Disease Reporting and Surveillance System [CDRSS] or in writing) all invasive cases of GAS to the local health officer having jurisdiction over the locality in which the patient lives, or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located.

2. The N.J.A.C. 8:57-1.8 stipulates that each local health officer must report the occurrence of any case of invasive GAS, as defined by the reporting criteria in Section 2A above. Current requirements are that cases be reported to the NJDHSS Infectious and Zoonotic Diseases Program (IZDP) electronically using the confidential and secure CDRSS.

5 CASE INVESTIGATION

A. Form

There is no required paper form that is required when reporting GAS invasive disease.

B. Laboratory Reports

1. If the local health department receives a report of GAS from the laboratory or healthcare provider, local health department staff should enter the report into CDRSS, and

investigate the case by contacting the patient, a family member or the healthcare provider by telephone to complete the information requested according to the CDRSS data entry chart below.

NOTE: Since healthcare-associated outbreaks of GAS require immediate attention, mailing requests for information is considered too time-consuming, and is therefore not recommended under any circumstances.

2. If a report of GAS from the laboratory or healthcare provider is received by NJDHSS, and includes the patient's address, NJDHSS will enter the report into CDRSS as PENDING; the report will not be mailed to the local health department.

3. If a report of GAS from the laboratory or healthcare provider received by NJDHSS does not include the patient's address, NJDHSS will either return the report to the sending laboratory or healthcare provider or call the sender to obtain a complete address. Once this information is received, the report will be entered into CDRSS as PENDING.

C. CDRSS

The mandatory fields in CDRSS include: disease, last name, county, municipality, gender, race, ethnicity, case status, report status.

The following table can be used as a quick reference guide to determine which CDRSS fields need to be completed for accurate and complete reporting of invasive GAS cases. The "CDRSS Screen" column includes the tabs which appear along the top of the CDRSS screen. The "Required Information" column provides detailed explanations of what data should be entered.

CDRSS Screen	Required Information
Patient Info	Enter the disease name ("STREPTOCOCCUS PYOGENES") patient demographic information, illness onset date, and the date the case was reported to the local health department (LHD). There are two subgroups for *S. pyogenes*, "GAS WITHOUT STSS" and "GAS WITH STSS."
Addresses	Enter any alternate address as needed. Use the Comments section in this screen to record any pertinent information about the alternate address. Entering an alternate address will allow other disease investigators access to the case if the alternate address falls within their jurisdiction.

CDRSS Screen	Required Information
Clinical Status	Enter any treatment that the patient received and record the names of the medical facilities and physician(s) involved in the patient's care. If the patient received care from two or more hospitals, be sure that all are entered so the case can be accessed by all infection control professionals (ICPs) covering these facilities. If the patient is alive, select "NO" in the Mortality section. If the patient died, select "YES" in the Mortality section and add the date of death.
Signs/Symptoms	Check appropriate boxes for signs and symptoms and indicate their onset. Make every effort to get complete information by interviewing the physician, the case-patient, family members, ICP, or others who might have knowledge of the patient's illness. Also, information regarding the resolution of signs and symptoms should be entered. **NOTE:** To ensure that all cases of STSS are identified check to see if the patient has a history of hypotension. If not, continue to investigate as a case of GAS. If the case is hypotensive, continue to investigate to determine if the case is associated with STSS.
Risk Factors	Enter complete information about risk factors (e.g., recent breaks in skin) if they are known
Laboratory Eval	Select "STREPTOCOCCUS PYOGENES IDENTIFIED" if culture of a normally sterile site (e.g., blood, cerebrospinal fluid, synovial fluid) was performed. If culture of a nonsterile site was performed, select "STREPTOCOCCUS PYOGENES IDENTIFIED" and record the type of specimen in the Comments section only if it is not available as an option in the specimen drop-down list. Specimen type, specimen collection date, test result, and, if applicable, test value should also be recorded.
Contact Tracing	Information regarding contacts is not required for sporadic cases of this disease. Specific information that should be gathered during an outbreak investigation will be determined at the time of the outbreak.
Case Comments	Enter general comments (i.e., information that is not discretely captured by a specific topic screen or drop-down menu) in the Comments section. **NOTE:** Select pieces of information entered in the Comments section CANNOT be automatically exported when generating reports. Therefore, whenever possible, record information about the case in the fields that have been designated to capture this information; information included in these fields CAN be automatically exported when generating reports.

CDRSS Screen	Required Information
Epidemiology	Information regarding epidemiologic investigative exposures is not required for sporadic cases of this disease. Specific information that should be gathered during an outbreak investigation will be determined at the time of the outbreak.
Case Classification Report Status	Case status options are: "REPORT UNDER INVESTIGATION (RUI)," "CONFIRMED," "PROBABLE," "POSSIBLE," and "NOT A CASE." • All cases entered by laboratories (including LabCorp electronic submissions) should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)." • Cases still under investigation by the LHD should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)." • Upon completion of the investigation, the LHD should assign a case status on the basis of the case definition. "CONFIRMED," "PROBABLE" and "NOT A CASE" are the only appropriate options for classifying a case of *S. pyogenes* or STSS (see section 2A). Report status options are: "PENDING," "LHD OPEN," "LHD REVIEW," "LHD CLOSED," "DELETE," "REOPENED," "DHSS OPEN," "DHSS REVIEW," and "DHSS APPROVED." • Cases reported by laboratories (including LabCorp electronic submissions) should be assigned a report status of "PENDING." • Once the LHD begins investigating a case, the report status should be changed to "LHD OPEN." • The "LHD REVIEW" option can be used if the LHD has a person who reviews the case before it is closed (e.g., health officer or director of nursing). • Once the LHD investigation is complete and all the data are entered into CDRSS, the LHD should change the report status to "LHD CLOSED." • "LHD CLOSED" cases will be reviewed by DHSS and be assigned one of the DHSS-specific report status categories. If additional information is needed on a particular case, the report status will be changed to "REOPENED" and the LHD will be notified by e-mail. Cases that are "DHSS APPROVED" cannot be edited by LHD staff (see Section C below). If a case is inappropriately entered (e.g., a case of *S. pneumoniae* was

CDRSS Screen	Required Information
	erroneously entered as a case of *S. pyogenes*) the case should be assigned a report status of "DELETE." A report status of "DELETE" should NOT be used if a reported case of invasive GAS simply does not meet case definition. Rather, it should be assigned the appropriate case status, "NOT A CASE."

D. Other Reporting/Investigation Issues

1. It is not always possible to obtain all the information necessary to classify a case. A minimum of three attempts (not necessarily to the same person) should be made to obtain necessary information. If information cannot be obtained after these three attempts, the case should be entered into CDRSS if it has not been already. The number of attempts and the dates and outcomes of the attempts should be documented in the Comments section. The case status should be changed to "NOT A CASE" and the report status changed to "LHD CLOSED."

2. Every effort should be made to complete the investigation within three months of opening a case. Cases which remain open for three months or more and have no investigation or update notes will be closed by NJDHSS and assigned a case status of "NOT A CASE."

3. Once an LHD completes its investigation and assigns a report status of "LHD CLOSED," NJDHSS will review the case. NJDHSS will change the report status to "DHSS APPROVED," if appropriate, upon completion of its review. At this time, the case will be locked for editing. If additional information is received after a case has been assigned a report status of "DHSS APPROVED," an LHD will need to contact NJDHSS to reopen the case. This should be done only if the additional information changes the case status.

6 CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (NJAC 8:57-1.10)

None.

B. Protection of Contacts of a Case

Depending on the number of cases of invasive GAS, in certain settings or situations, recommendations may include antibiotic prophylaxis for potential carriers, *varicella* vaccination for susceptible children, and throat cultures for contacts. See "Managing Special Situations," directly below.

C. Managing Special Situations

1. Daycare

One case of invasive GAS in a daycare center is not usually a cause for alarm. However, to better characterize the situation, the following questions should be asked:

- Was the case-patient's illness preceded by *varicella* infection?
- Have any *varicella* cases been reported in the daycare center in the previous two weeks? If so, how many and what were the dates of illness onset?
- Have any cases of pharyngitis or impetigo been reported at the daycare in the previous two weeks? If so, how many and what were the dates of illness onset? Investigators will be required to develop a line list to document information about all cases of known and suspect GAS illness. The information to be included in the line list should include, at a minimum, the date of birth of case-patients, symptoms, dates of illness onset, laboratory testing performed, dates of absence from daycare, and whether there are other known cases of GAS involving close contacts (e.g., family members).When attempting to identify cases of GAS in toddlers, be aware of the atypical clinical presentations described in Section 1.B.
- The recommendations for control will depend on the answers to the above questions and the information obtained via the line list. Control measures will include review of hand washing protocols for attendees and staff as well as exclusion of symptomatic attendees and staff. The public health response may also include obtaining throat cultures for all symptomatic daycare contacts, with subsequent antibiotic treatment of those who are culture-positive for GAS.
- LHD staff should contact IZDP at 609.588.7500 to report suspected or confirmed cases in a daycare center (or any other childcare setting). The IZDP staff will work with LHD staff to ensure all contacts are identified and notified.

2. School

As described above for daycare centers, one case of invasive GAS in a school is not necessarily a cause for alarm. While GAS is much more likely to spread in a daycare setting, the health officer will need to determine if the case-patient recently had *varicella* and how many cases of pharyngitis, impetigo and *varicella* are occurring in the school. As described for situations involving a daycare center, the recommendations for control will depend on the answers to these questions. Control measures may include obtaining throat cultures for all symptomatic school contacts with subsequent antibiotic treatment of those who are culture-positive for GAS.

3. Hospital

GAS is an unusual cause of surgical site or postpartum infections. The bacterium is only isolated from <1% of surgical-site infections and 3% of infections after vaginal delivery. Since most nosocomial transmission is traced to carriers involved in direct patient care, **even one case of postoperative or postpartum GAS should be vigorously investigated**. Usually the infection control professional (ICP) or hospital epidemiologist will investigate to find a possible carrier. Investigations usually consist of medical and laboratory record reviews,

further characterization of the GAS isolates, screening of healthcare workers from multiple sites, and sometimes environmental testing. In 1991 there was a healthcare acquired GAS outbreak in NJ involving four postoperative patients who experienced serious sequelae. This outbreak was associated with an anesthesiologist with anal carriage of GAS.

4. Long-Term Care (LTC) Facilities

Cases of invasive GAS infection in a long-term care facility, while rare, do occur. Steps should be taken to rule out the possibility of a more widespread problem. At a minimum, surveillance should include the floor where the case-patient resides and focus on other residents with possible symptoms of GAS infection, such as fever, sore throat or wound infection. These residents should be tested for GAS infection and treated if positive. Additional cases of invasive GAS would require a more vigorous response. IZDP will work with the LHD staff to determine the best prevention and control measures to implement and how to proceed with a more rigorous investigation. This might involve screening healthcare workers and asymptomatic residents, and perhaps environmental testing. In 2000 there were four LTC-associated outbreaks of GAS in New Jersey, and one in January 2008.

5. Reported Incidence Is Higher than Usual/Outbreak Suspected

If the number of reported cases in the city/town is higher than usual, or if an outbreak in a school, daycare center, hospital or long-term care facility is suspected, LHD staff should contact the IZDP as soon as possible at 609.588.7500. This situation may warrant an investigation of clustered cases to determine a course of action to prevent further cases. IZDP staff can also perform surveillance for clusters/outbreaks that involve multiple jurisdictions, which would otherwise be difficult to detect at the local level.

D. Preventive Measures

1. Environmental Measures

Daycare centers should be advised to clean toys daily using an approved disinfectant (i.e., an EPA-registered sanitizing solution safe for use in the daycare setting) and to discourage the use of play food, which facilitates the transmission of not only this bacterium but other infectious agents as well. Schools should be advised to frequently sanitize shared sports equipment, such as wrestling or gymnastic mats. Healthcare facilities should ensure that all equipment and supplies are stored and used exclusively within the same unit.

2. Personal Preventive Measures/Education

To protect themselves from potential future exposures, advise individuals to:

- Practice good hygiene, including frequent hand washing
- Avoid sharing food, beverages, cigarettes or eating utensils
- Receive *varicella* vaccine if indicated

7 OUTBREAK SITUATIONS

If the number of reported cases in an institutional setting or jurisdiction is higher than usual for the time of year, an outbreak might be occurring. In accordance with NJAC 8:57, IZDP should be contacted immediately at 609.588.7500. This situation may warrant an investigation of clustered cases to determine a course of action to prevent further cases. In contrast to what routinely occurs at the local level, IZDP staff can perform surveillance for clusters of illness that may cross several jurisdictions and thereby be better able to assess the extent of an outbreak during its infancy.

Additional Information

Additional information about GAS infection is available on CDC website (http://www.cdc.gov/).

References

American Academy of Pediatrics. Red Book 2003: Report of the Committee on Infectious Diseases, 26th Edition. Illinois, American Academy of Pediatrics, 2003.

American Academy of Pediatrics. Severe Invasive Group A Streptococcal Infections: A Subject Review. Pediatrics. 1998;101:136-140.

CDC. Case Definitions for Infectious Conditions Under Public Health Surveillance, MMWR. 1997; 46:RR-10.

CDC. Nosocomial Group A Streptococcal Infections Associated with Asymptomatic Health-Care Workers − Maryland and California, MMWR. 1997; March 5, 1999; 48:8.

Chin, J., ed., Control of Communicable Diseases Manual, 17th Edition. Washington, DC, American Public Health Association, 2000.

Mandell, G., Benett J., Dolin R., Principles and Practice of Infectious Diseases. Churchill Livingstone, 2000.

Massachusetts Department of Public Health, Division of Epidemiology and Immunization. Guide to Surveillance and Reporting. Massachusetts Department of Public Health, Division of Epidemiology and Immunization, January 2001.

Working Group on Prevention of Invasive Groups A Streptococcal Infections. Prevention of Invasive Group A Streptococcal Disease Among Household Contacts of Case-Patients. JAMA. 1998; 279:1206-1210.